HOODWIN

The Lassig Plant of the
American Bridge Company

Civil Engineering
B. S.
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THE LASSIG PLANT
OF THE
AMERICAN BRIDGE COMPANY

BY

HYMAN JACOB HOODWIN

THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

IN

CIVIL ENGINEERING

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

PRESENTED JUNE, 1908

UNIVERSITY OF ILLINOIS

June 1, 1908

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

HYMAN JACOB HOODWIN

ENTITLED THE LASSIG PLANT OF THE AMERICAN BRIDGE COMPANY

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF Bachelor of Science in Civil Engineering

Ira O. Baker
Instructor in Charge.

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HEAD OF DEPARTMENT OF Civil Engineering

Introductory

Within the past thirty years the advances in the manufacture of steel have resulted in enhancing its quality and reducing its cost to such an extent as to render it an almost perfect metal. The marvelous increased use of steel for structural purposes attending this development in its manufacture has practically revolutionized the art of bridge building. In this country especially has this advancement been particularly noticable, and the enviable record of American enterprise in structural work has been an object of admiration the world over. In commenting on this line of American activity

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English writer pays a glowing tribute to the undisputed American supremacy by stating: "One tires of writing suberlatives about the American steel industry." At the time he was writing, this gentleman had in mind among other things the world-wide discussion created by the awarding to an American firm of the work of constructing the Atbara bridge in Africa. In this instance the Pencoyd Iron Works not only won the award because of having put in the lowest bid, but it also agreed to put the bridge up in less than half the time of its nearest English competitor, notwithstanding the fact that the American plant is three thousands of miles farther away from the scene of construction.

Numerous similar instances might be given, all of which tend to impress one with the high degree of development which has been attained by American genius in this great industry.

In view of the above facts, the writer decided to make the subject of his thesis a study of one of the representative American shops describing the method there employed of fabricating the parts of steel structures. It is hoped that the results of his work may find readers among those interested in this important branch of engineering. This thesis is a description of the shop and methods at the Lassig Plant of the American Bridge Company - a representative shop of America's largest structural company.

The writer gathered the information for this thesis during the past summer vacation while he was employed in this plant.

Location and General Description

The Lassig Plant is located in the north western portion of the City of Chicago near Deering Station on the Chicago and North Western Railway, and is bounded on the South by Wrightwood and Clybourn Aves, on the West by Lincoln St. on the North by Diversey Boul., and on the East by the tracks of the C. and N.W. Ry.. The plant covers a tract of about 8½ acres and has a capacity of 4000 tons per month. Unlike most plants of more recent construction Lassig has grown up with the development of the steel industry. The original plant was very much smaller than that in operation at present, different portions having been added from time

to time as its field of operation expanded. For, this reason the facilities for locating the different parts of the plant in the most advantageous position conducive to the greatest economy of time and labor were not as good as in the case of many of the plants built in recent years. Nevertheless, the additions have been placed judiciously and the result is an arrangement which compares very favorably with the best practice in structural-shop design.

It is the aim of those designing modern bridge plants to so arrange the different parts of the works that raw material may enter at one end and keep moving up from one stage in the process of manufacture to the next, until it finally emerges at the other end completely fabricated and

ready for final inspection and shipment. This system avoids loss of time attending the moving of material back and forth and precludes the causing of unnecessary delays by compelling one piece of work to be kept waiting while another is moved down the track and out of the way.

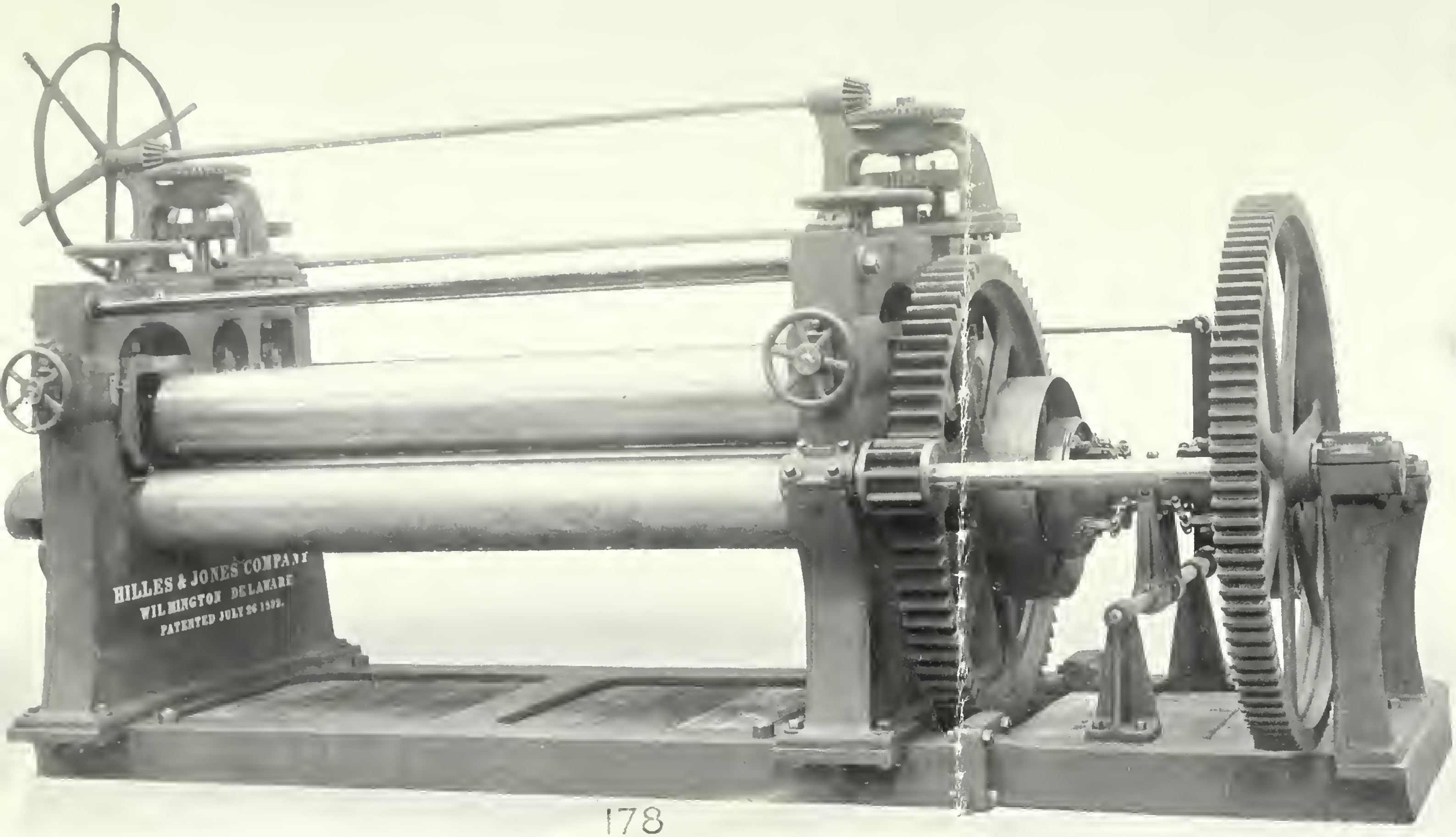
In the ensuing description we will follow the material through the shop in its successive stages, describing the operations in each shop and noting any special advantages or disadvantages of the methods used. To assist in this description reference will frequently be made to the general floor plan of the plant, Plate I and also to the larger scale drawings in Plates II, III, and IV, appended herewith.

Receiving Yard

Practically all the raw material used at Lassig comes from the Illinois Steel Works at South Chicago and from the Carnegie Steel Co. at Pittsburg, Pa., all that the former is unable to supply being furnished by the latter. The material is shipped to the plant via the C. and N. W. Ry., whose tracks run alongside and enter the plant by means of two spurs, as is shown on Plate I. All the plates used in the shop are run in on the east spur. The cars are run upon a side track and then backed into the Store Room where the plates are assorted and stacked in proper places with the aid of a number of three-to

beam electric travelling cranes, indicated by the number 70 on Plate IV.

In this section of the shop is also the plate straightening machine a view of which may be seen in Fig. 1, page 9. Plates which were bent, buckled, or distorted during shipment or handling are run through this machine. It consists of six 12-inch steel rollers so placed that the material passing between them receives direct vertical pressure only. A regulating device attached to the machine adjusts the distance between the rollers. This distance may be made unequal at the ends so that one side of the plate may be stretched by the excess pressure thus brought to bear on it.



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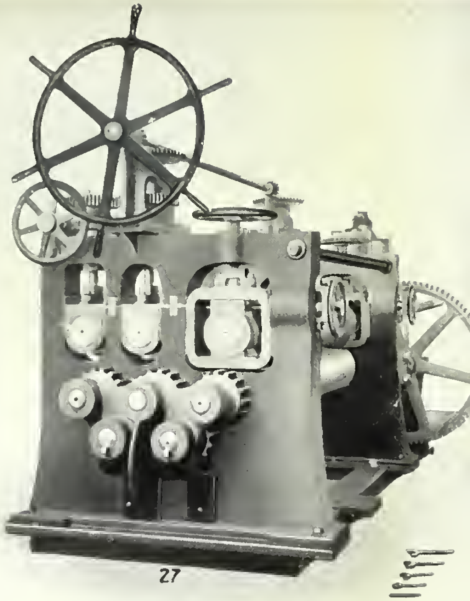


Fig. 1.

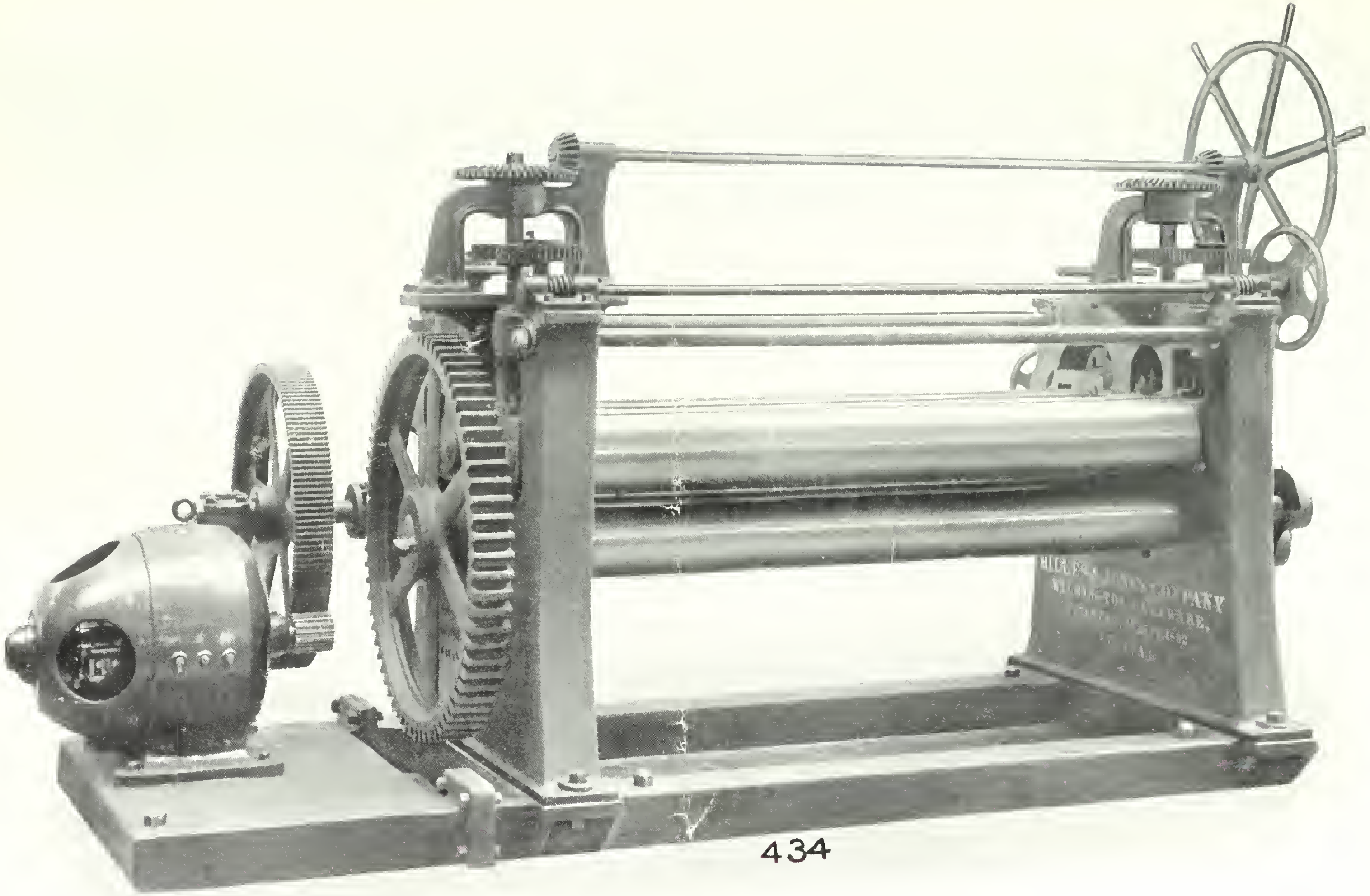
No. 3 Patented Plate Straightening Rolls

The number three machine has six rolls, each 12 inches in diameter and is furnished in the following standard lengths between housings:

10 feet 2 inches.	Code, Pauper.	7 feet 2 inches.	Code, Pawner.
9 feet 2 inches.	Code, Paver.	6 feet 2 inches.	Code, Peace.
8 feet 2 inches.	Code, Pawl.	5 feet 2 inches.	Code, Peach.

Driving may be by electric motor, duplex steam engine or belts.

9.



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No. 2 Patented Plate Straightening Rolls

The number two machine has six rolls, each ten inches in diameter and is furnished in the following standard lengths between housings:

8 feet 2 inches.	Code, Peaked.
7 feet 2 inches.	Code, Peal.
6 feet 2 inches.	Code, Pearl.
5 feet 2 inches.	Code, Pebble.
4 feet 2 inches.	Code, Pecan.

End view of the housings is illustrated on page 197. Driving may be by electric motor, duplex steam engine or belts. General description on page 195. Full specifications are necessary when making inquiry for prices.

Angles, channels, beams, and zee-bars enter the shop on the west spur and are unloaded and stacked in a manner similar to that described above.

In the southwest end of the Store Room, near the west wall is placed an oil furnace (marked "F" plate IV) and a crimping machine. Here angles which are to be crimped are placed in the furnace and heated to a cherry red. They are then removed in pairs placed back to back, and inserted in the crimping machine which presses and rounds them into the required shape. A right-hand and left-hand crimped angle are thus made in one operation.

Drafting Room Work

Before following the raw material farther let us go back and see what occurs in the office end of the plant during the first stages of the work. The large bridge and structural concerns, such as the American Bridge Co, nowadays seldom get complete detailed drawings of the structure which they contract to manufacture. All they are given with the specifications is a stress sheet showing merely the principal data and measurements. When this stress sheet is received at the office a squad of draftsmen is put to work detailing the structure. After their drawings are completely checked and traced bl

prints are made and sent to the Templet Shop, to the shop foremen who are to have in charge the assembling of the parts, and to the inspectors who are to see that the shop work is properly done.

The Templet Shop

A templet is a model of a portion of a steel or iron structure, to be used in laying-out or marking the raw material for fabrication. Templets are usually made of a good grade of well seasoned white pine about $\frac{7}{8}$ inch thick. Owing to the increasing price of lumber heavy strawboard has been substituted for use in making templets with good success. These, however, are

at present used only where a small number of pieces of the article to be laid out is required, as the rivet holes in strawboard easily wear and affect the accuracy of the work. On the templets the position of all bevels, notches, and rivets is accurately located, and the rivet holes are carefully drilled through with a half-inch drill.

The Templet Shop is fitted with all the accessories of the ordinary wood or pattern shop, including the usual band saws, planers, drill plates, tools and benches. The tape used in this shop for making measurements is a standard steel tape adopted by the American Bridge Co. and guaranteed to correspond with the U. S. Standard

at 62° Farenheit with a pull of twelve pounds. As each templet is made it is marked with the order number and a notation indicating its location in the structure. For example, the notation; "#5675 Top. Lat. 7 R. ⑧" would indicate that the piece so marked is part of the right-hand top lateral brace number seven for order number 5675, and eight such pieces are required.

At the north end of the Templet Shop is a large room containing lofts on which the templets of structures in the process of erection are stored. The large amount of space which these require together with the difficulty in handling stacks of lumber is another argument in favor

of substituting some other material in place of wood for this purpose.

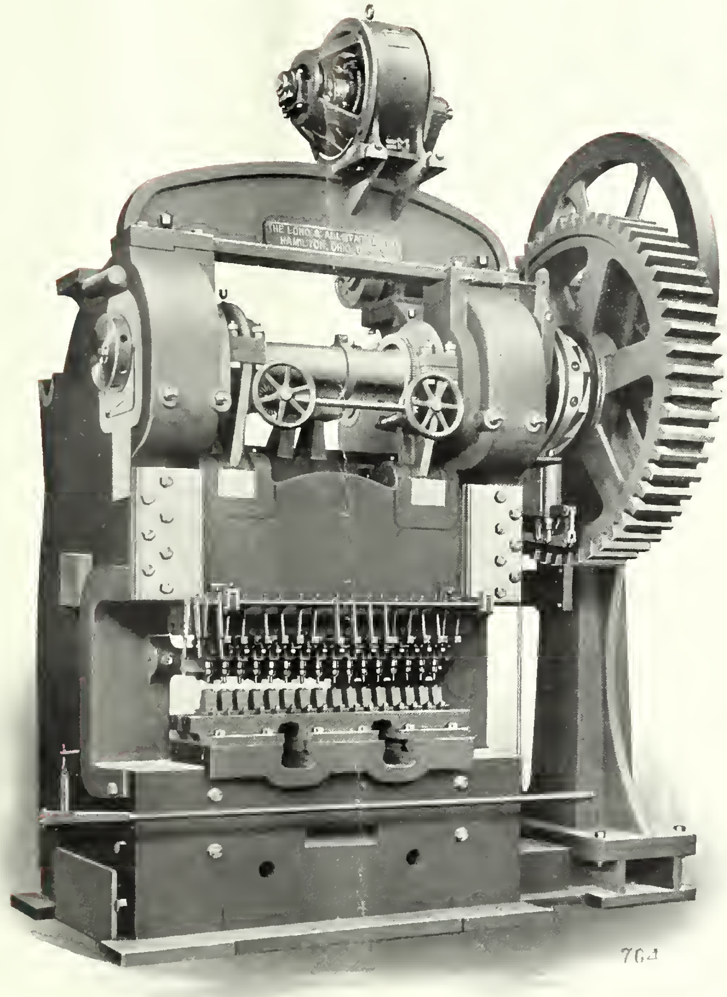
After the templets are constructed they are sent to the Laying-Out Shop, where we will now continue following the raw material as it progresses through the shop.

Laying-Out Room

The process of laying-out a piece of work consists in clamping a templet to the piece of steel and marking on the latter the notches, bevels, and rivets which it requires. The first two markings are made with a piece of soapstone crayon. The rivets are located by means of a center punch which snugly fits the holes drilled in the templet. This punch is inserted in a hole and given a sharp blow

with a hammer, thus marking the position of the rivet on the metal. Obviously, the laying-out process is a comparatively slow one and makes it an important part of the shop cost.

In order to reduce the shop cost at this stage the multiple punch, located in the center of the Store in Laying-Out Room, and illustrated in Fig. 2, page 17, is now extensively used. When this machine is employed no templet for the purpose of locating rivets is required. The keyboard-like arrangement in the center of the cut shows the arrangement of the punches, the spacing of which is set for each



Size No. H, Multiple Punch.

(62 inches wide between the housings.)

Photo No. 764 *Code-word, "Aclaches"*

For punching holes in groups or in rows, the number depending upon the size of the holes and the thickness of the material. Made in different widths between housings from 24 to 200 inches, with throats any depth from 6 to 36 inches; to drive by belt, steam engine or electric motor. Provided with automatic stop which stops the slide up on completion of each stroke.

Stroke of slide, 2½ inches.
Distance between slide and lower jaw, 20 [illegible] inches.
Pulleys, 30 inches diameter, 7¼-inch face, when belt-driven
Double geared, 14 to 1

Cam shaft of forged steel
Clutch jaws, steel-faced.
Steel cam pintles bushed with bronze.

Fig. 2.

particular case. To each of these punches is attached a horizontal rod which, when pulled out, causes the punch to slide through an opening thereby neglecting to operate and leaving the metal unpunched. Thus the operator stands before the machine with plan in hand and, with the aid of these horizontal rods, may cause any combination of holes to be punched for a given spacing.

The material approaches the machine on a long runner together with a steel tape on which the distance between groups of rivet holes is accurately marked. When the member is brought to the proper position a lever is pressed which causes the machine to operate and punch the

desired number of rivet holes all at one time. This machine is quite expensive and requires a very skilled and reliable operator who usually commands a salary of about ten dollars per day. The reason for this is obvious when we consider the great losses which are liable to result from mistakes in punching large sheets of steel. The multiple punch may therefore be profitably employed only on plates requiring a number of symetrically spaced rivet holes, or on a number of shapes to be similarly punched. Doubtless the design of structural members in the future will be made expressly with a view of utilizing the benefits of this machine whenever possible.

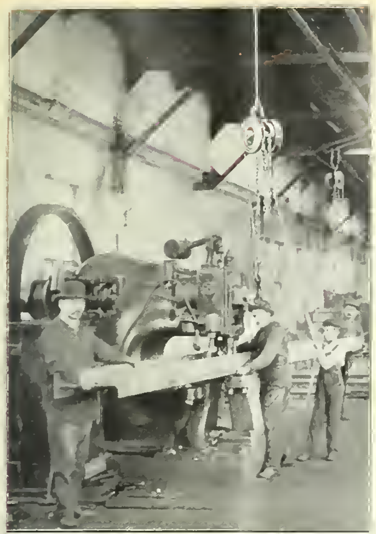
Shear and Punch Shop

After leaving the Laying-Out Room the material passes through the Shop in two divisions. In the west half (see Plate III) truss members, such chords, posts, and the like are made; while in the east half plate-girder work is done. The machines used in both sections are practically alike, those in the latter, however, being somewhat the larger and heavier, as they are required to handle the heavier material. Steel sections, just as the plates, are often bent out of shape in shipping, and in this shop they are run through a straightening machine which acts horizontally by means of a cam attachment and exerts great local pressure on the bent part. When the section is very badly distorted

it may become necessary to heat and hammer it into shape. This work is done in the Hammer Shop (see Plate III) which is furnished with furnaces and steam hammers for this purpose.

For some classes of work it is necessary to bend a piece of steel to some required curve. This work is done in the Bending Roll Room, adjoining the Hammer Shop (see Plate III). In this case the work must digress from its continuous forward movement and be transferred laterally back and forth. Although this is not usually desirable, the amount of material requiring this transporting is comparatively small and it is probably most feasible to do the work is stated.

During the process of shearing and punching, the larger material is handled by means of block and tackle or air hoists. The Yale and Towne blocks, shown in Figs. 3 and 4, page 23, with capacities ranging from one to five tons, are the types in most common use. Another type of hoist (see Fig. 5, page 23), a number of which are distributed through the shop, is the motor hoist which is operated either electrically or by means of compressed air. The hoists are supported on beams 25 or 50 feet in length, which travel on tracks laid on the lower chords of the transverse bents. The bents are spaced twenty feet apart and are nearly all fitted with these transverse travellers; and thus all parts of the floor space are covered.



Yale & Towne Triplex Blocks on overhead carrier system for handling and conveying structural steel.

Fig. 3.

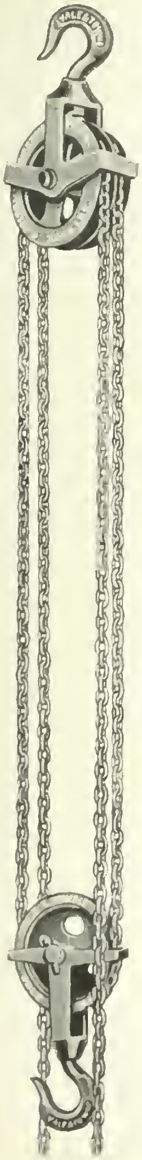
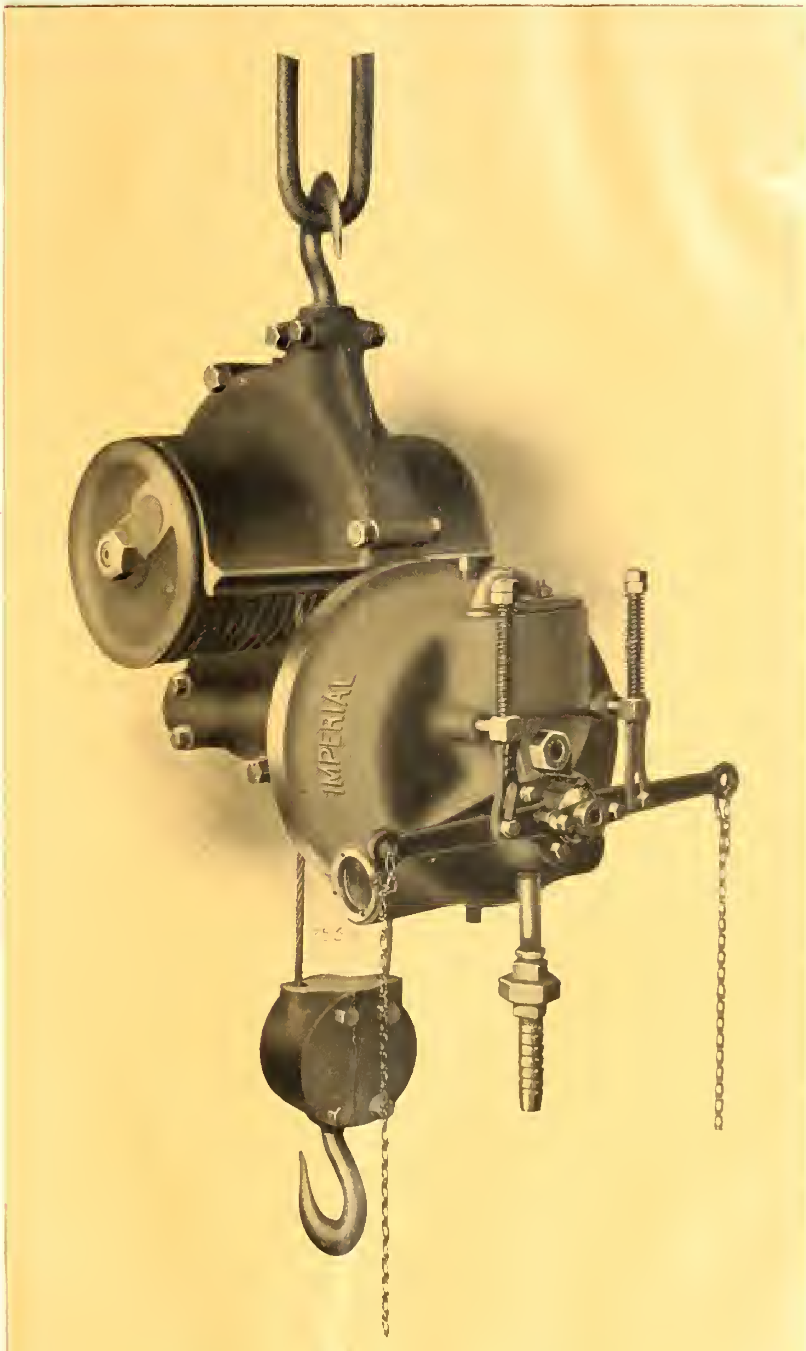


Fig. 4.

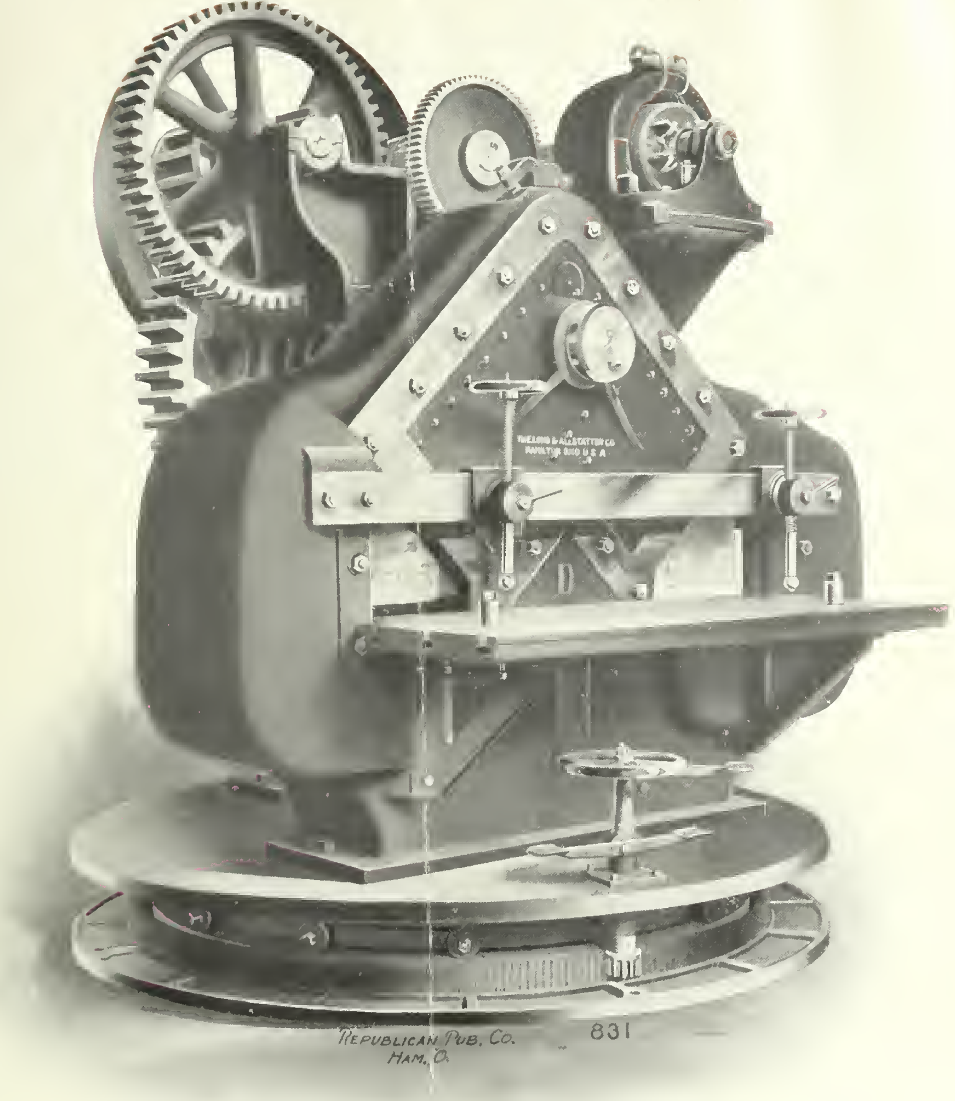


"Imperial" Motor Hoist, Nos. 1 and 2.

Fig. 5.

In the Shear and Punch Shops plates, angles, and other sections are sheared to length, beveled if necessary and punched. The double angle-shear, illustrated in Fig. 6, page 25, is especially convenient for shearing a series of angles of opposite hand, that is, making part "right hand" angles and part "left." The right is sheared with the blade on the right side of the machine and the "left" with the blade on the left. The machine is mounted on a turntable so that it may be revolved for an oblique cut to avoid swinging long angles across the shop and interfering with other work. Fig. 7, page 26, illustrates a shear used for large plates such as are required for plate girder webs.

The ordinary type of punch used



Size No. D, Angle-iron Shear on Turn-table

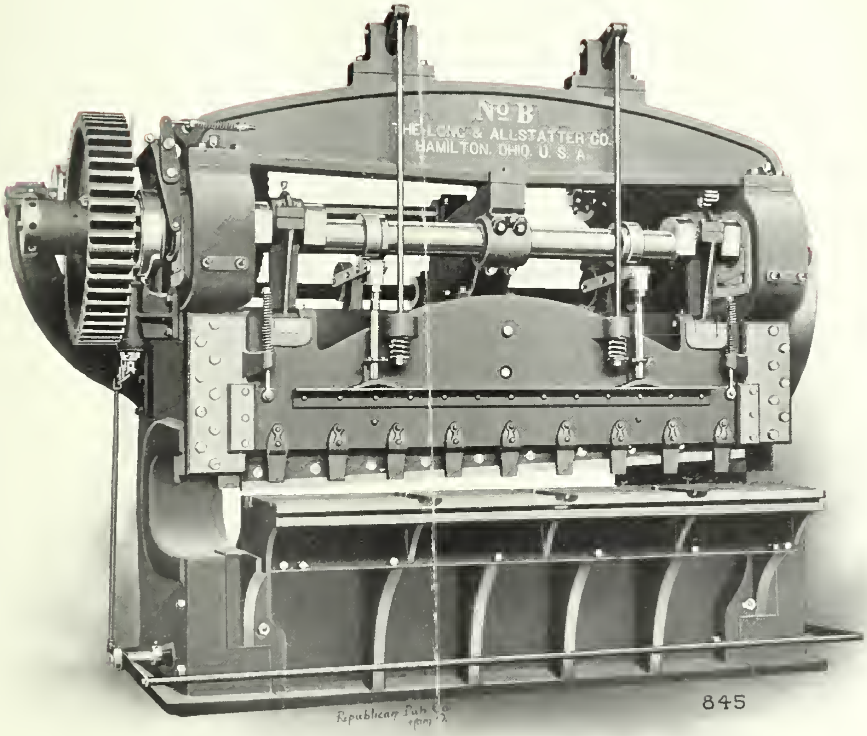
Photo No. 831 *Code-word, 'Acjigl'*

Capacity. To cut off 8 x 8 x 1¼-inch angles.

For shearing right and left hand angles, to cut them off square or mitering to any angle up to 45 degrees. Made with and without turn-table, to drive by belt, steam engine or electric motor.

Stroke of slides, 2⅞ inches
Pulleys, 30 inches diameter 6¼-inch face.
Cam shaft of forged steel.
Slides of cast steel.
Clutch jaws, steel faced.
Slide gibs of bronze.
Steel cam pintles and main journal bearing bushed with bronze.
Table in front with adjustable gauges and screws with hand wheels for clamping bars while shearing.

Fig. 6.



Size No. B, Gate Shear.

(100 inches wide between the housings.)

Photo No. 845 *Code-word, "Acqoda"*

Capacity. To shear $\frac{7}{8}$-inch and lighter plate

Made any width between the housings, from 24 to 132 inches, with throats any depth from 6 to 36 inches; to drive by belt, steam engine or electric motor. Furnished with table or brackets in front for supporting the work, automatic hold-down for clamping the work while shearing, and automatic stop which brings the slide to rest at the completion of each stroke, with the blades open.

Pulleys, 30 inches diameter, $6\frac{1}{4}$ inch face, when belt-driven.
Double geared, $14\frac{1}{2}$ to 1

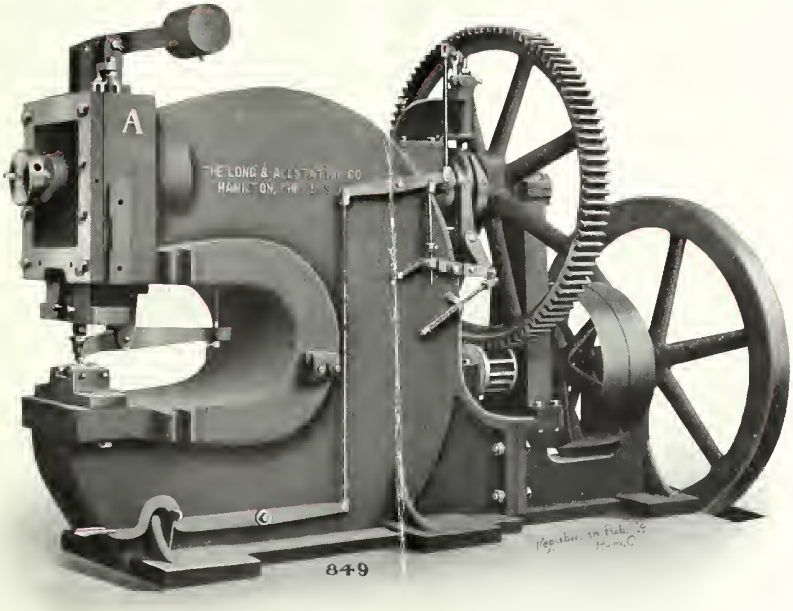
Cam shaft of forged steel.
Clutch jaws, steel-faced.
Steel cam pintles bushed with bronze

Fig. 7.

is illustrated in Fig. 8, page 28. In order to economize space double machines, as illustrated in Fig. 9, page 29, are frequently employed. These may be a combination of two shears, two punches, or one shear and one punch. Punches also are used having deep jaws so as to receive large sized plates. These machines are electrically operated, usually by a Westinghouse motor placed on top of each, as the illustrations referred to show.

Assembling Shop.

When the parts of built-up members reach the Assembling Shop they are put together by fitting gangs. First, all surfaces which are to come into contact or which will be inaccessible



Size No. A, Single Machine

Photo No. 849 *Code-word. "Ablat"*

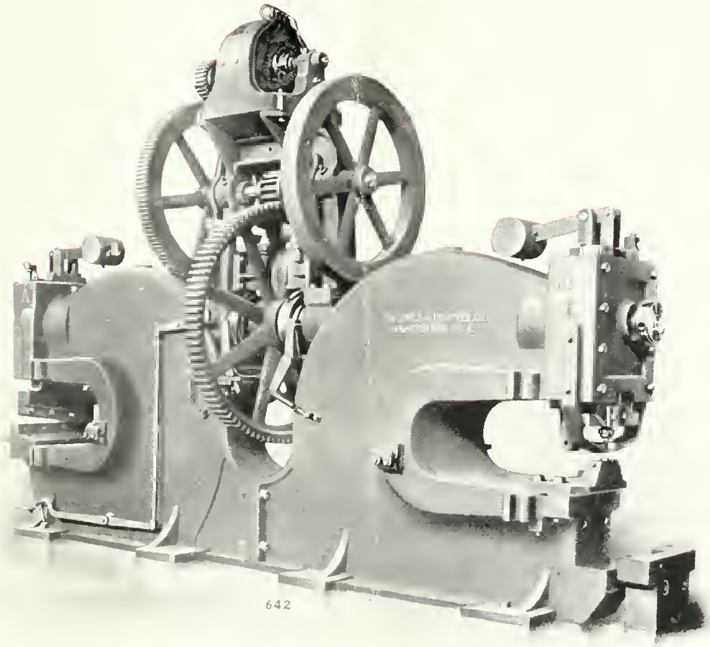
Capacity
- Will punch 2-inch hole through 1⅛-inch thickness
- Will shear
  - 8 by 1¼-inch flat bars
  - 2¼-inch round bars

For general purpose punching or shearing; to drive by belt, steam engine or electric motor

Distance between lower jaw and slide when down, 11¼ inches.
Width of lower jaw, 20¼ inches.
Opening in lower jaw 6½ by 4½ inches.
Stroke of slide 2 inches.
Pulleys, 30 inches diameter, 6¼ inch face.
Geared 7 to 1

Cam shaft of [illegible] steel
[illegible]
Slide [illegible] bronze
[illegible]

Fig. 8.



Size No. A, Double Machine.

Photo No. 642 *Code-word "Ableeko"*

Capacity { Will punch 2-inch hole through $1\frac{1}{8}$-inch thickness.
Will shear { 8 by $1\frac{1}{8}$-inch flat bars.
$2\frac{1}{4}$-inch round bars.

For general purpose punching or shearing; to drive by belt, steam engine or electric motor
Each side of machine operates independent of the other.

Distance between lower jaw and slide when down, $11\frac{1}{4}$ inches.
Width of lower jaws, $20\frac{1}{4}$ inches.
Openings in lower jaws, $6\frac{1}{2}$ by 4 [illegible] inches.
Stroke of slides, 2 inches.
Pulleys, 30 inches diameter, $6\frac{1}{4}$-inch face.
Geared 7 to 1.

Cam shafts of forged steel.
Clutch jaws steel-faced.
Slide gibs of bronze.
Steel arm, pintle, and main journal bearings bushed with [illegible]

Fig. 9.

after erection are well coated with some mineral paint which is specified for each order. The parts are then bolted up with bolts placed in every third to fifth hole. Drift pins are used to assist in bringing corresponding holes exactly over each other. It is important that the assembling gang bolt the members up as tightly as possible as the succeeding operation of reaming may not be properly executed if the parts fit loosely. The flanges for plate girders are assembled on skids in the space between the two narrow gauge tracks opposite the set of 17 reamers (see Plate III. These, after being reamed, are run down to the rivet shop where the web plates are inserted and the girder is completely assembled

with the aid of bolts and drift pins as above noted. The girders are handled by four twenty-ton electric travelling cranes, see Fig. 10, page 32, which travel across the width of the Rivet Shop (Plate II), and run on tracks laid on the lower chords of the transverse bents. These travellers are operated from two elevated booths placed along the east wall of the shop so as to command an unobstructed view of the work being handled.

Chord members, posts, etc., are assembled on skids placed in the west Rivet Shop (see Plate III). The material in the Assembling Shops is handled almost exclusively with cylinder air hoists, see Fig. 11, page 33, which act very quickly and effectively.

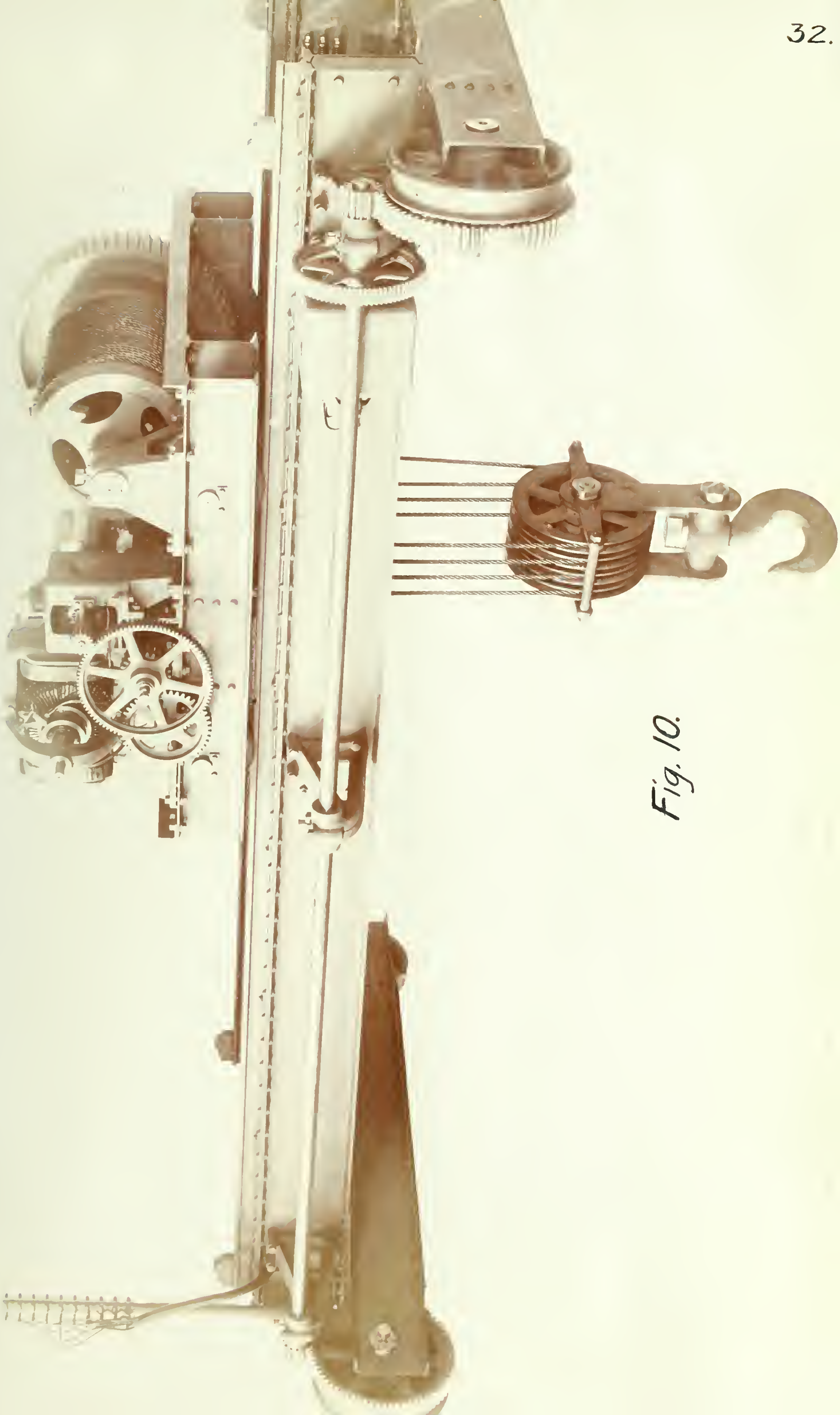
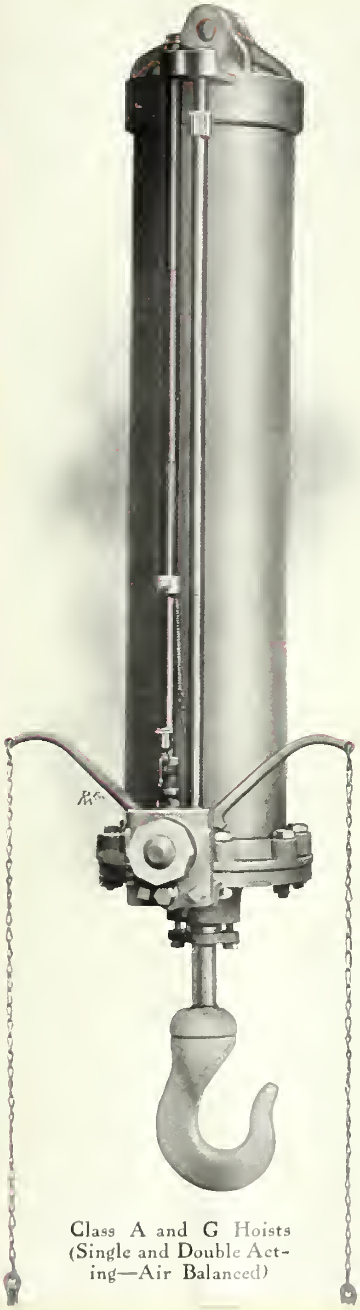


Fig. 10.



Class A and G Hoists
(Single and Double Acting—Air Balanced)

Class A & G Air Hoists

Cylinder

Steel tubing—Turned, ground and polished.

Lower Head

Cast steel ring screwed on. Cast iron head bolted thereto without any packing. Has drainage opening.

Piston

Screwed to piston rod and locked securely. Specially prepared leather cups which are air-tight.

Safety Device

The upper head on standard hoists drilled with proper size hole to prevent accident in case sling breaks.

Drains

Lower cylinder head has pipe plug to drain cylinder.

Cylinder Lubrication

Upper cylinder head has pipe plug for occasional introduction of oil to cylinder.

Fig. 11.

after each member is assembled and before it is sent to be reamed, the foreman of the assembling gang marks the order number and description on it with yellow paint to indicate that he has completed his work on it. Then the shop inspector carefully measures it with a standard steel tape, compares his measurements with the drawings, and finally marks his "OK" on it with yellow paint. The member is now ready for reaming.

Reaming Shop.

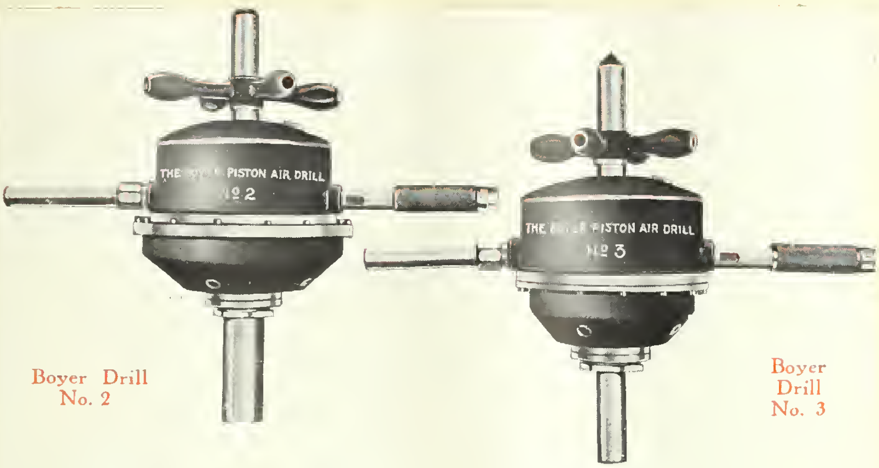
In punching holes through steel the punch will almost invariably tear and injure the metal around the hole to a greater or less extent, so as to reduce its strength materially. This seems almost unavoidable. Specifications therefore generally require

holes to be punched $\frac{1}{8}$ or $\frac{3}{16}$ inch smaller than the diameter necessary, the remainder of the metal being reamed or bored out. The reamer used for this purpose may be described as a jointed-arm pivoted at one end and free to move about and cover a semi-circular area having a radius of about six and one-half feet.

Plate girder flanges after being assembled are transported across to the set of 17 reamers along the east wall (see Plate III), and there reamed. Plate girders, which are assembled in the Rivet Shop as above noted, must be brought back to the middle set of reamers, shown on Plate III.; and when reamed, must be returned to the Rivet Shop. This is an undesirable feature as it often

blocks traffic along the main track and causes many serious delays; but under the circumstances this method is probably the only feasible one. It is frequently necessary to ream holes in a member after it has left the reamers. For this purpose the portable pneumatic rotary piston drill, illustrated in Figs. 12(a) and 12(b), page 37, is used.

There has been considerable discussion as to whether or not punching holes in steel really injures the metal and whether the process of reaming tends to increase its strength and lengthen the life of a structure. Evidently reaming is an expensive operation and if it could be shown to be unnecessary an important item in the shop cost



Boyer Drill No. 2

Weight 45 pounds. Adapted for drilling up to 3 inches in diameter and reaming and tapping up to 2 inches in diameter. Fitted with $\frac{5}{8}$-inch square tap socket and No. 4 Morse Taper Socket.

Code . . . . Abortive

Boyer Drill No. 3

Weight 35 pounds. Adapted for drilling up to 2 inches in diameter and reaming and tapping up to $1\frac{1}{2}$ inches in diameter. Fitted with $\frac{5}{8}$-inch square tap socket and No. 3 Morse Taper Socket.

Code . . . . . . Abortment .

Fig. 12(a).

Little Giant Non-Reversible Drills

No. 0 Drill

Weight 55 lbs. Adapted for boring cylinders and extra heavy drilling, reaming and tapping. Fitted with No. 4 Morse Taper Socket. No. 5 Morse Taper Socket or $\frac{3}{4}$-inch square tap socket furnished when specially ordered.

Code . . Abode

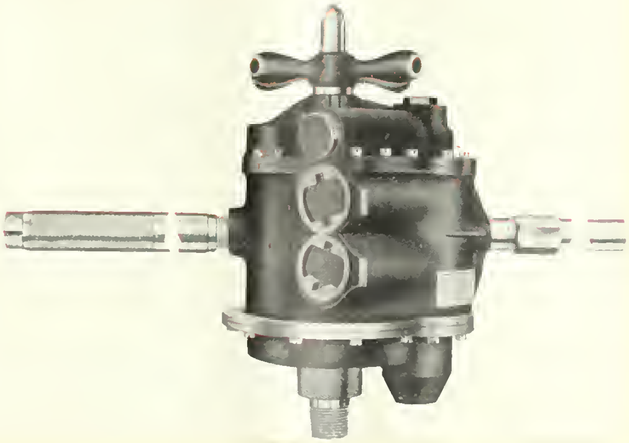


Fig. 12(b).

could be eliminated. One of the arguments put forth against the practice of reaming is that the red-hot rivet, when placed in the hole during the process of riveting anneals the metal sufficiently to make up for the injury caused by punching. Whether or not this is true remains for experimenters interested in this subject to determine. As a general rule, when reaming is specified, it includes the entire structure with the exception of lacing bars and their connections, which are not designed to take stress. Furthermore, while some claim that reaming is unnecessary, others go still farther on the opposite side of the argument and specify that all holes, after being reamed, shall be filleted; that is, they shall b

scraped so as to remove the feathery and ragged edges left by the reamers. The advocates of this practice claim that a much tighter joint is thus obtained. This specification is, however, not very common except in important work where much depends upon the efficiency of the riveted connections.

The Rivet Shop.

The riveting is done with pneumatic riveters which are either stationary (see Fig. 13, page 40), or portable, being suspended from a traveller by means of a block and tackle (see Fig 14, page 41). The lighter members which may be handled conveniently with a block and tackle are usually riveted with the former, while the latter is used on large heavy work. Fig. 15, page 42, illustrates the method of riveting plate girders with the portable type.

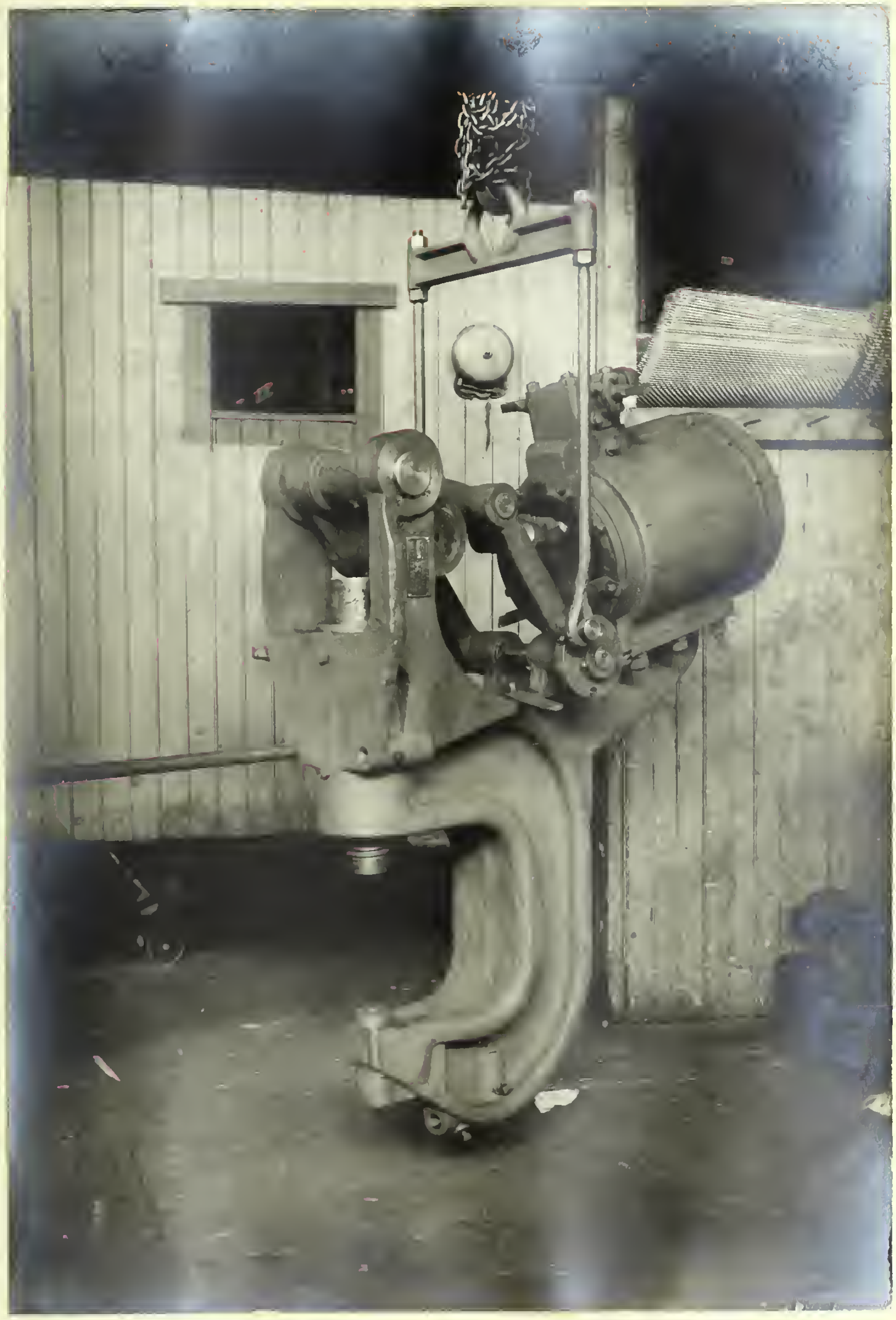
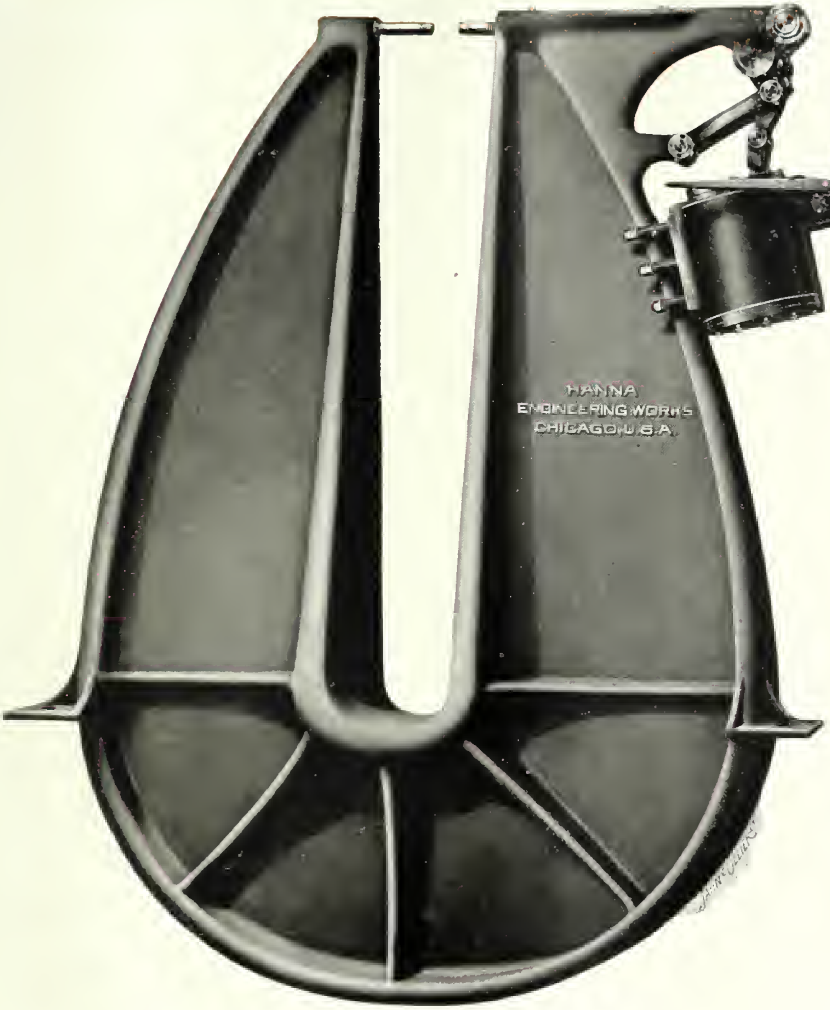


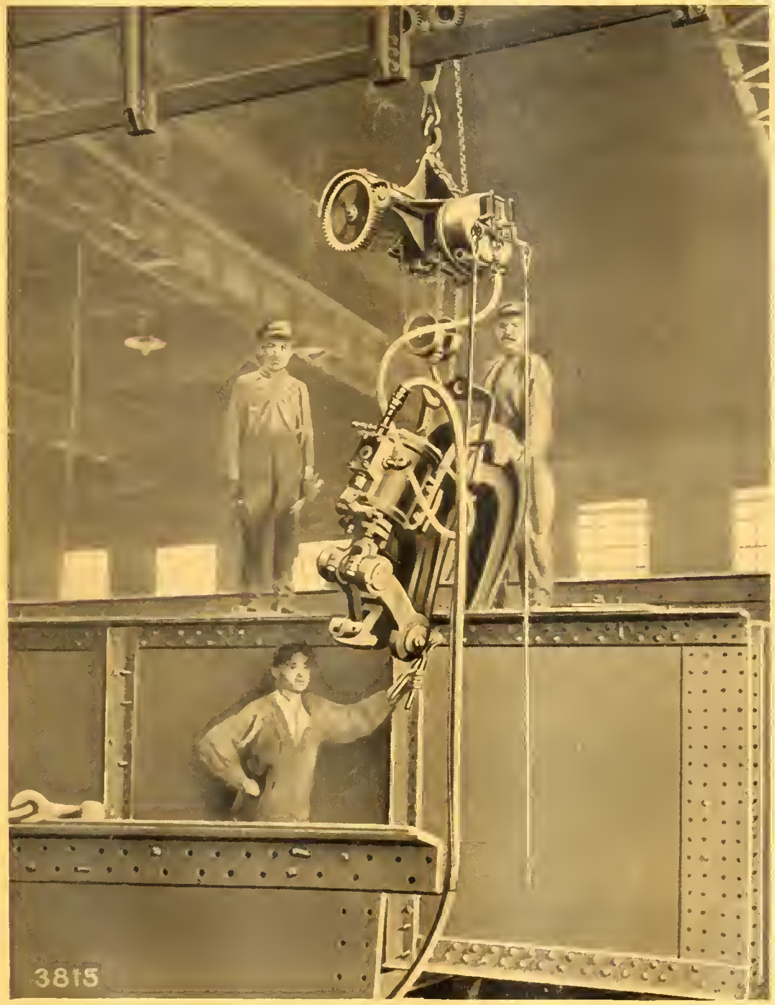
Fig. 13.



102 inch Reach, 18 inch Gap, 70 tons Pressure.

Stationary machines can be furnished of any reach, gap or Pressure.

Fig. 14.



Holding a Yoke Riveter with an "Imperial" Hoist.

Fig. 15.

There has been considerable discussion regarding the relative merits of hydraulic and compressed-air riveting machines. It seems to be the general opinion among several authorities that the hydraulic type is the better for the reason that air toggle machines, unlike the former require an adjustment of the grip for every change of thickness of the metal. However, the newer form of air and oil riveter, in which the toggle joint is replaced by a cylinder of oil, is said to do away with the objectionable features of the compressed-air type, and at the same time, retain its convenience in operation.

The rivets used in the operation of riveting are heated in brick furnaces (located at points marked "F" on Plates II and III) which use

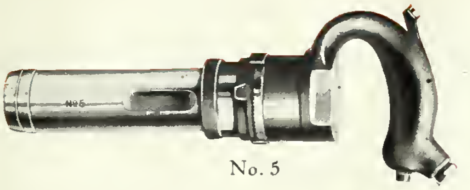
crude oil for fuel. The oil flows by gravity from a five gallon tank set in the roof truss of the Boiler Room. Compressed air used for draft is also delivered to the furnaces through a system of pipes at a pressure of 95 lbs. per sq. in.. In these furnaces a great heat is developed in a very short time, making them very desirable for this purpose. When the riveting is completed the shop inspector carefully examines the rivets by tapping them with a light hammer in order to detect loose ones. These he marks with a daub of yellow paint which indicates that they are to be removed. If loose rivets are not discovered until the member is removed from the vicinity of the furnace and riveting machine, they are removed and then replaced by means of

the pneumatic hammer, see Fig. 16, page 46. This tool operates so as to strike a large number of rapid blows and does very effective, though comparatively slow, work. With the aid of a small portable forge rivets may thus be driven at any place about the plant to which compressed air may be piped. A type of this tool, called the chipping hammer, see Fig. 17, page 47, is used where chipping is necessary to remove small amounts of superfluous metal on any member, so that the parts may be fitted together more easily. In this tool the cup of the riveter is replaced by a cold chisel, as is indicated in the illustration.

Milling and Boring Shop

Posts, girders having abutting faces, and all other members having bearing surfaces are usually made $\frac{1}{4}$ inch

Boyer Long Stroke Riveting Hammers

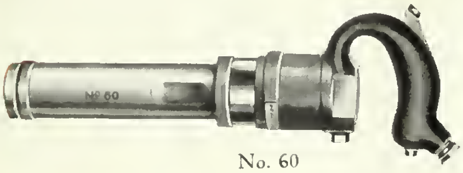


No. 5

No. 5 Riveting Hammer

Weight 20 pounds; 5-inch stroke; capacity up to ¾-inch rivets.

Code............ Aaronical

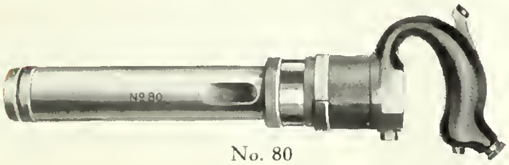


No. 60

No. 60 Riveting Hammer

Weight 22 pounds; 6-inch stroke; capacity up to ⅞-inch rivets.

Code	Standard......	Abacist
	Heavy......	Abacistern
	Extra Heavy.	Abacistor



No. 80

No. 80 Riveting Hammer

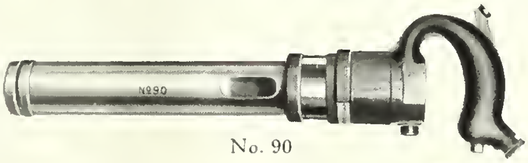
Weight 23 pounds; 8-inch stroke; capacity up to 1⅛-inch rivets.

Code	Standard......	Abacot
	Heavy	Abacotem
	Extra Heavy ..	Abacotix

No. 90 Riveting Hammer

Weight 25 pounds; 9-inch stroke; capacity up to 1¼-inch rivets.

Code	Standard......	Abactor
	Heavy........	Abactus
	Extra Heavy ...	Abactry

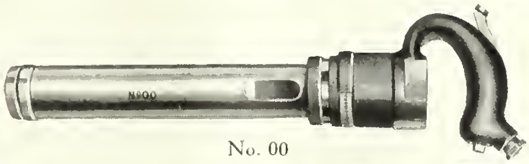


No. 90

No. 00 Riveting Hammer

Weight 23 pounds; 9-inch stroke; capacity up to 1⅛-inch rivets. Very rapid blow.

Code	Standard......	Abadace
	Heavy.........	Abadal
	Extra Heavy ...	Abadam



No. 00

Push handle can be applied to either the No. 60 or No. 80 as desired.

Code	No. 60	Abadesa
	No. 80......	Abaisance

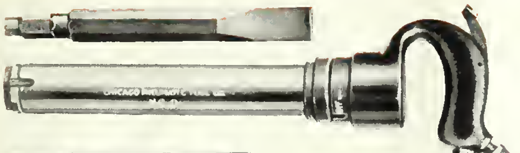
Boyer Push Handle Hammer

Three rivet sets, blank or finished to suit requirements, are furnished with each of the above hammers. Best results are obtained from an air pressure of 100 pounds.

We can furnish Boyer Riveting Hammers with closed handles when so specified on orders. When ordering by telegraph use Code.......................... Abaissal in connection with code word shown above for size hammer desired.

Fig. 16.

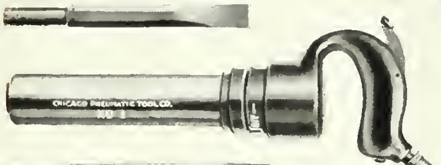
Boyer Chipping, Calking and Beading Hammers.



New Boyer
No. 0

For extra heavy chipping and calking and light riveting; weight 13½ pounds.

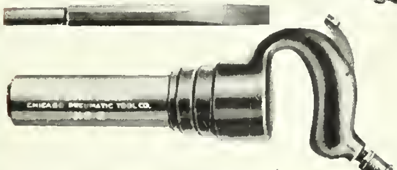
Code { Round . . . . Abant
Hexagon . . . . . . Abantus



No. 1

For heavy chipping and calking and light riveting; weight 11½ pounds.

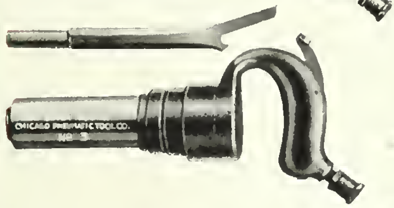
Code { Round . . . . . . Abbotship
Hexagon . . . Abbreviate



No. 2

For medium calking and chipping; weight 10½ pounds.

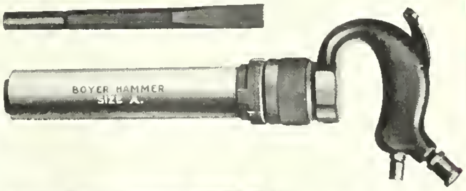
Code { Round . . . . Abcoude
Hexagon . . . . . . Abceder



No. 3

Light chipping, calking and flue beading; weight, 9¾ pounds.

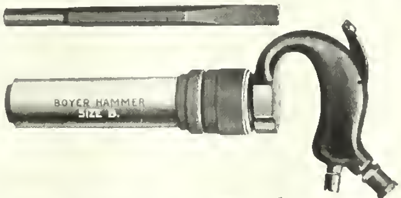
Code { Round . . . . Abdals
Hexagon . . . . . Abderite



A

For heavy chipping, calking and light riveting; weight 10 pounds.

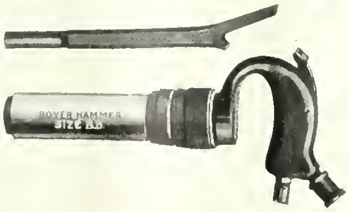
Code { Round . . . . Abdicate
Hexagon . . . . Abdication



B

For medium calking and chipping; weight, 8½ pounds.

Code { Round . . . . Abdiquer
Hexagon . . . . Abditary



BB

For light chipping and calking; weight 7 pounds.

Code { Round . . . . Abdomen
Hexagon . . . . Abdominal

Three hexagon or four round shank tool blanks are furnished with each of the above hammers. Hammers fitted with a round bushing to take round shank tools are used generally for chipping, calking and beading flues. In other words, hammer with round bushing is a general all-round tool, while hammer fitted with hexagon bushing to take hexagon shank tool is adapted to chipping only.

Fig. 17.

too long, and are milled or faced so that they may have an exact length and insure perfect bearing. This work is done on the rotary planers, see Fig. 18, page 49, a number of which are placed in the Milling and Boring Shop (Plate II). The member to be milled is set so that its axis is perpendicular to the plane of the rotating planer. The cutting tools are accurately set in the circle of openings shown in the illustration, and as the cutting edges come in contact with the member as the machine rotates the excess metal is gradually removed leaving the true surface desired.

Running parallel with the rotary planers are a series of boring machines, see Fig. 19, page 50. These machines are used to bore holes accurately in end-posts,

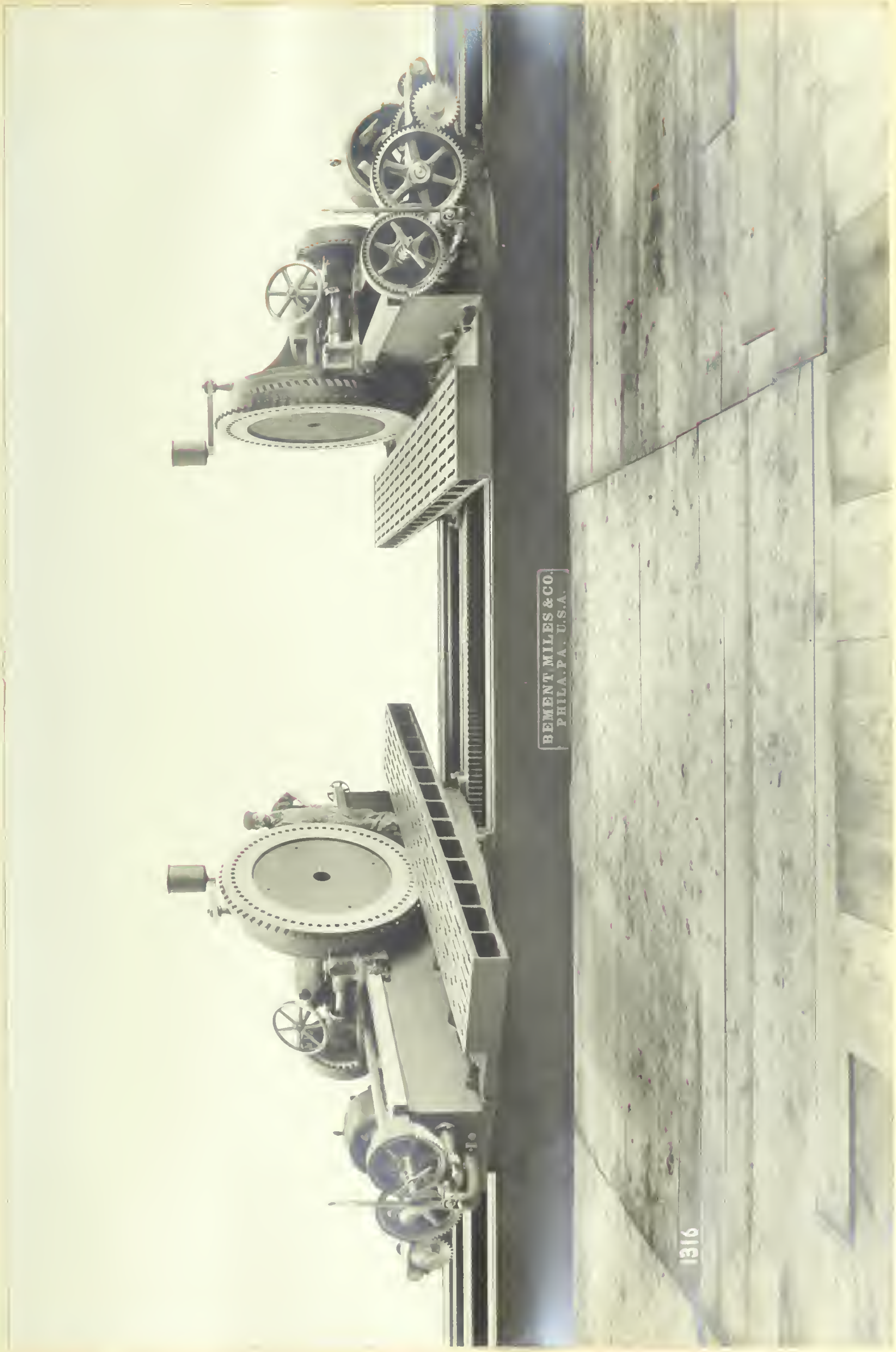


Fig. 18.

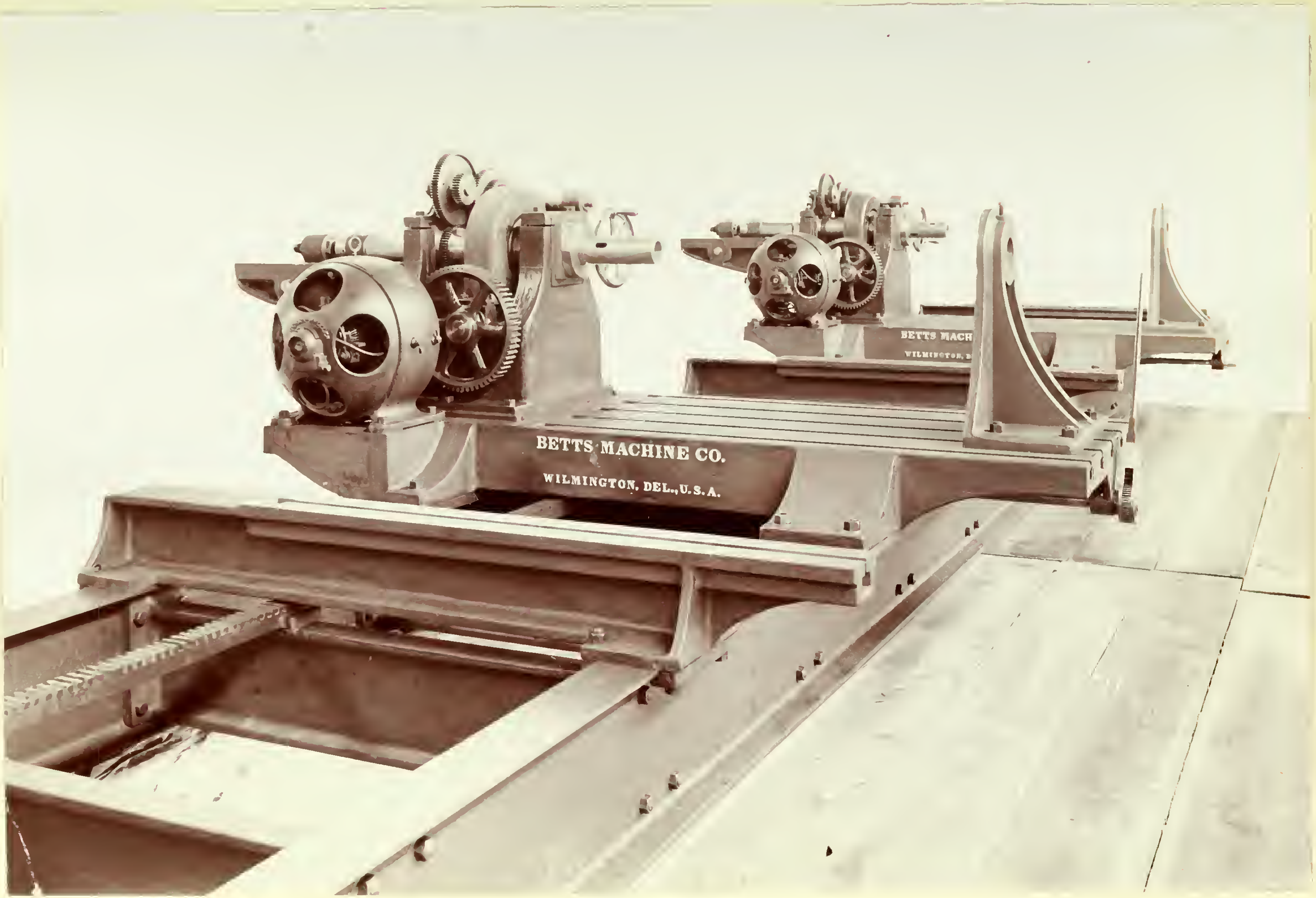

BETTS MACHINE CO.
WILMINGTON, DEL., U.S.A.
BETTS MACH
WILMINGTON, D

Fig. 19.

chord members, eye-bars, and the like, which are to receive bearing pins. As in the case of the milling machines the member in this case is clamped in a horizontal position and the die on the machine is set so as to gradually enlarge the opening, thus forming a smooth hole of the desired diameter. In this manner the usual specification which requires that, "pins less than $4\frac{1}{2}$ inches in diameter shall fit the pin hole to within $\frac{1}{50}$ inch, and pins of larger diameters shall have a clearance not greater than $\frac{1}{32}$ inch," is easily fulfilled.

Shipping Yards

As the material has passed through all of its stages in the main shop, it is now ready to be sent to the Shipping Yard. Before any piece leaves the shop for the yard

it must be weighed, and its weight recorded. This is done at two doors in the south end of the shop (Plate II) where Fairbanks track scales are conveniently placed. The actual weight of each piece is thus obtained for two reasons: to furnish data for making the final estimate of the cost of the structure, and to have a check on the amount of work turned out in the shop.

Plate-girders, cross-girders, and floor-beams are run into the south yard where they are first thoroughly examined by an inspector for the company ordering the work, then they are well coated with a specified paint, and finally, are loaded on cars and shipped.

There are a variety of paints used as a coating for structural steel. Different companies and engineers hav-

their own ideas of what is best to use, and specify accordingly. The paints most commonly used at Lassig are: raw linseed oil, boiled linseed oil, red lead, red lead and boiled linseed oil, iron ore, nobrac black, graphite, and leather graphite.

A large 50-ton gantry, spanning 114 ft. between tracks and a 55 foot boom derrick cover the space taken up by the yard, and handle all the material brought therein. The gantry is operated by steam, a hoisting engine being placed in a small traveling cab on top of it. This form is somewhat out of date as most gantries now built are run by electricity. The boom derrick is electrically operated.

Cross frames, lateral bracing brackets, diaphragms, and other such details,

which are assembled in the northeast corner of the Rivet Shop (Plate II), are taken out through a door in that section, and there painted and loaded on cars. A railway track scale is conveniently located there for weighing this material.

The parts of truss members made in the west half of the shop, as previously noted, are run back on the wide gauge track, shown in Plate II, into the north-west yard which is also furnished with a 55-foot boom derrick and a 25-ton gantry, both being operated like those in the south yard. In this yard riveted trusses are assembled, if space will allow, otherwise half or part of truss at a time is assembled and all connections accurately fitted and reamed.

so as to make certain that they will go together without any trouble on the site. To assist in this work a number of appliances such as screw-jacks, steamboat ratchets, turnbuckles, and the like, are kept on hand. When all the work on the truss members, including final inspection, is completed they are loaded on flat cars and shipped to the site.

Machine Shop

While the operations above described are going on in the main shop the cast iron and cast steel parts of structures requiring machining are being turned out in the Machine Shop, shown at the southeast end of the plant, see Plate II. This shop is thoroughly equipped with a variety of lathes, planers, shapers,

gear-cutters, drills, bolt machines, etc.. Among the parts of steel structures finished here are pins, journal boxes, rollers, anchor bolts, bearing and sole plates, and pedestals. This shop is also required to repair or replace all parts of machines or tools used in other parts of the plant.

Blacksmith Shop

Ordinarily, the principal article manufactured in the Blacksmith Shop is the eye-bar. None are, however, manufactured at Lassig. The shop is equipped with forges and large steam-hammers to take care of whatever smith work it may be called upon to do. It also contains two rivet machines with oil furnaces similar to those previously described. In the manufacture

of rivets long rods are placed in the furnace, and heated to a cherry red, after which they are removed and inserted in the rivet machine, which upsets, forms the head, and cuts them off at the proper length, all in one operation. Only a small portion of the rivets used in the shop are made here. The Rivet Room, where most of the rivets are made, may be seen in Plate I adjoining the Engine Room.

Bending Rool Room

The part in the manufacture taken by the Bending Roll Room has been previously described, and will not be treated here. At the north end of this room however, is a circular area which is of interest, see Plate III. This is a track on which the drums for large swing

bridges are assembled, and their bearing plates rolled and faced to a true plain.

The Power Plant

All the heat and power used in the works is furnished by the Power Plant, which is located in the middle of the west side of the plant, see Plate I. The Boiler Room is equipped with a battery of B.&W. boilers furnishing 1050 boiler horse-power. The Engine Room adjoining is fitted for transmitting all the necessary power to the Dynamos, air compressors, etc. The two oil tanks which may be seen back of the Boiler Room contains the crude oil used in the furnaces throughout the plant. The small Oil House adjoining the Rivet Room is used for the storage of linseed oil, bolt oil for the bolt machines, tallow, and machine oil.

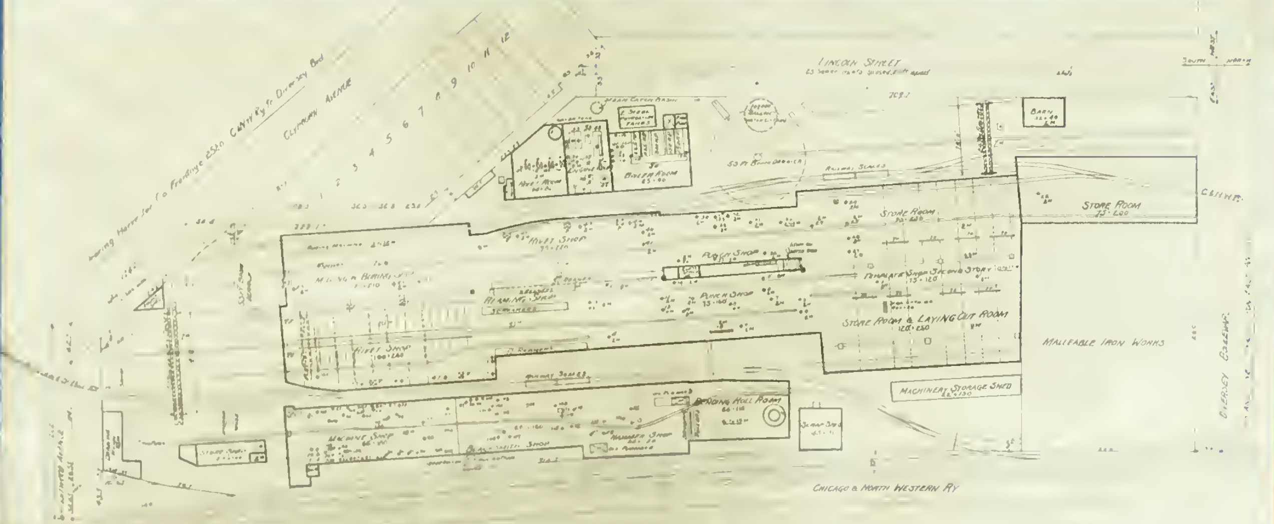
Offices and Drafting Department.

The main offices of the plant are located in a second story above the machine shop. The Blue Print Room adjoins the offices and is fitted with an apparatus which prints, washes, and dries blue prints very quickly.

The drafting rooms are in a separate two story brick building located at the south-east corner of the plant, see Plate II. About forty draftsmen are there employed.

The Lassig Plant, although it does not cover as great an area as a number of the modern bridge shops, is one of the largest in the country, as far as the amount of work it turns out is concerned. It

employs about seven hundred men working in two shifts — one during the day and the other at night. As noted previously it has not the space and arrangement of shops that some of the more recent plants have, but its organization is first class, as is testified by the large contracts which it handles annually and by the large amount of work which it turns out.



LASSIG PLANT
OF THE
AMERICAN BRIDGE COMPANY
CHICAGO ILLINOIS
Scale

PLATE I.

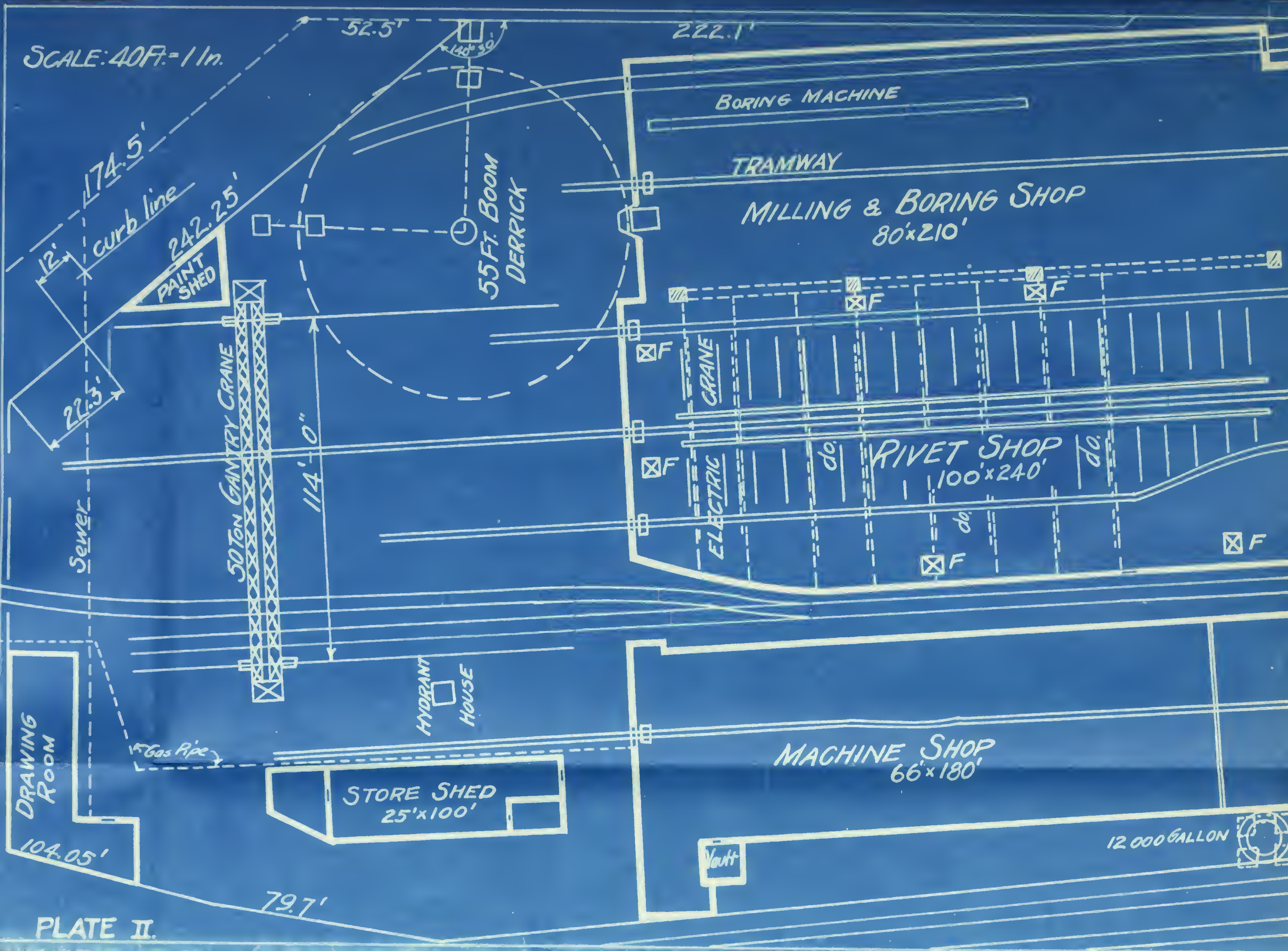


PLATE II.

SCALE: 40Ft.=1In.
52.5'
222.1'
140°30'
174.5'
curb line
242.25'
12'
22.3'
PAINT SHED
55Ft. BOOM DERRICK
BORING MACHINE
TRAMWAY
MILLING & BORING SHOP
80'x210'
F
F
F
F
F
F
CRANE
ELECTRIC
do.
do.
do.
RIVET SHOP
100'x240'
50 TON GANTRY CRANE
114'-0"
Sewer
HYDRANT HOUSE
Gas Pipe
DRAWING ROOM
104.05'
STORE SHED
25'x100'
MACHINE SHOP
66'x180'
Vault
12 000 GALLON
79.7'

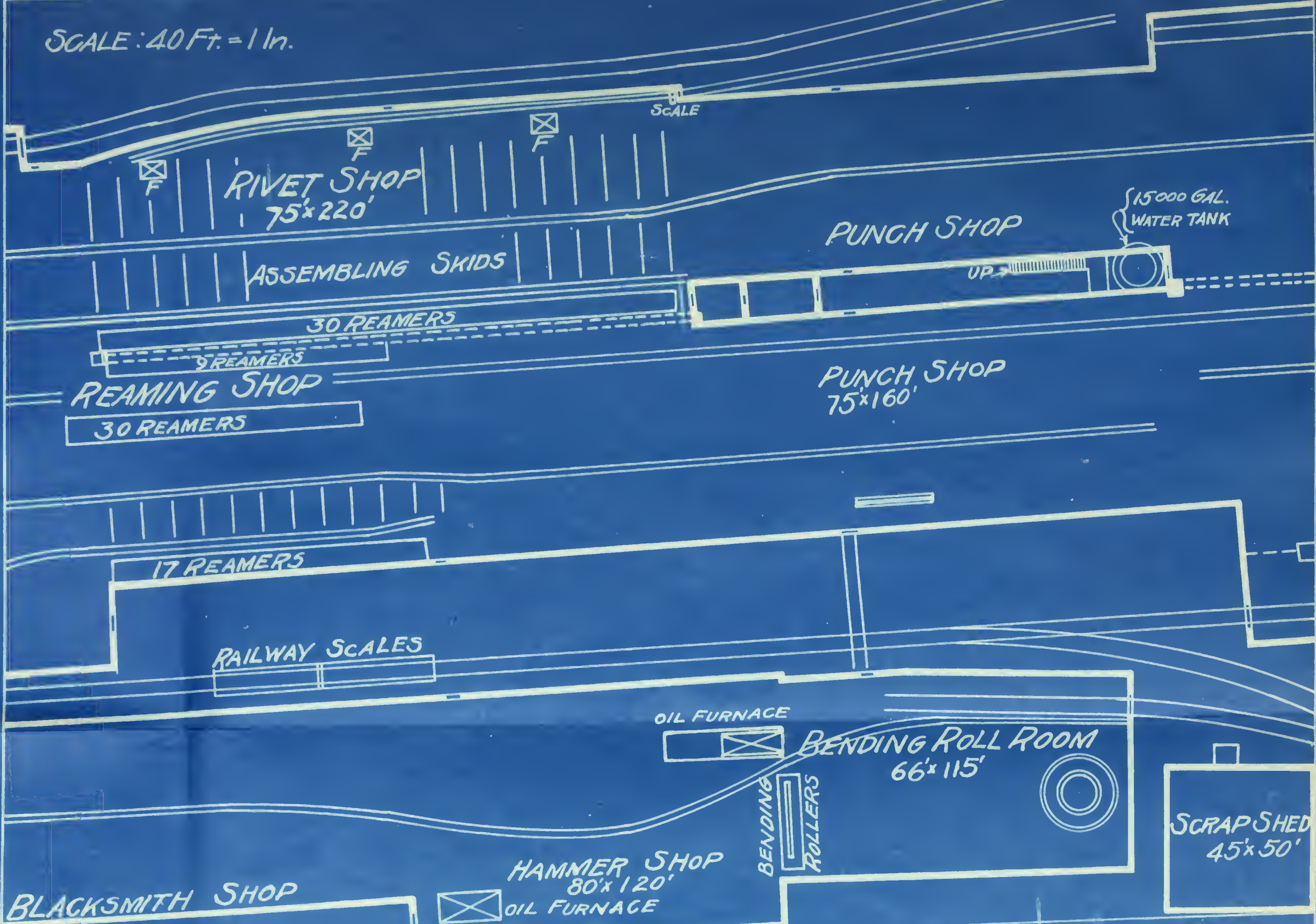
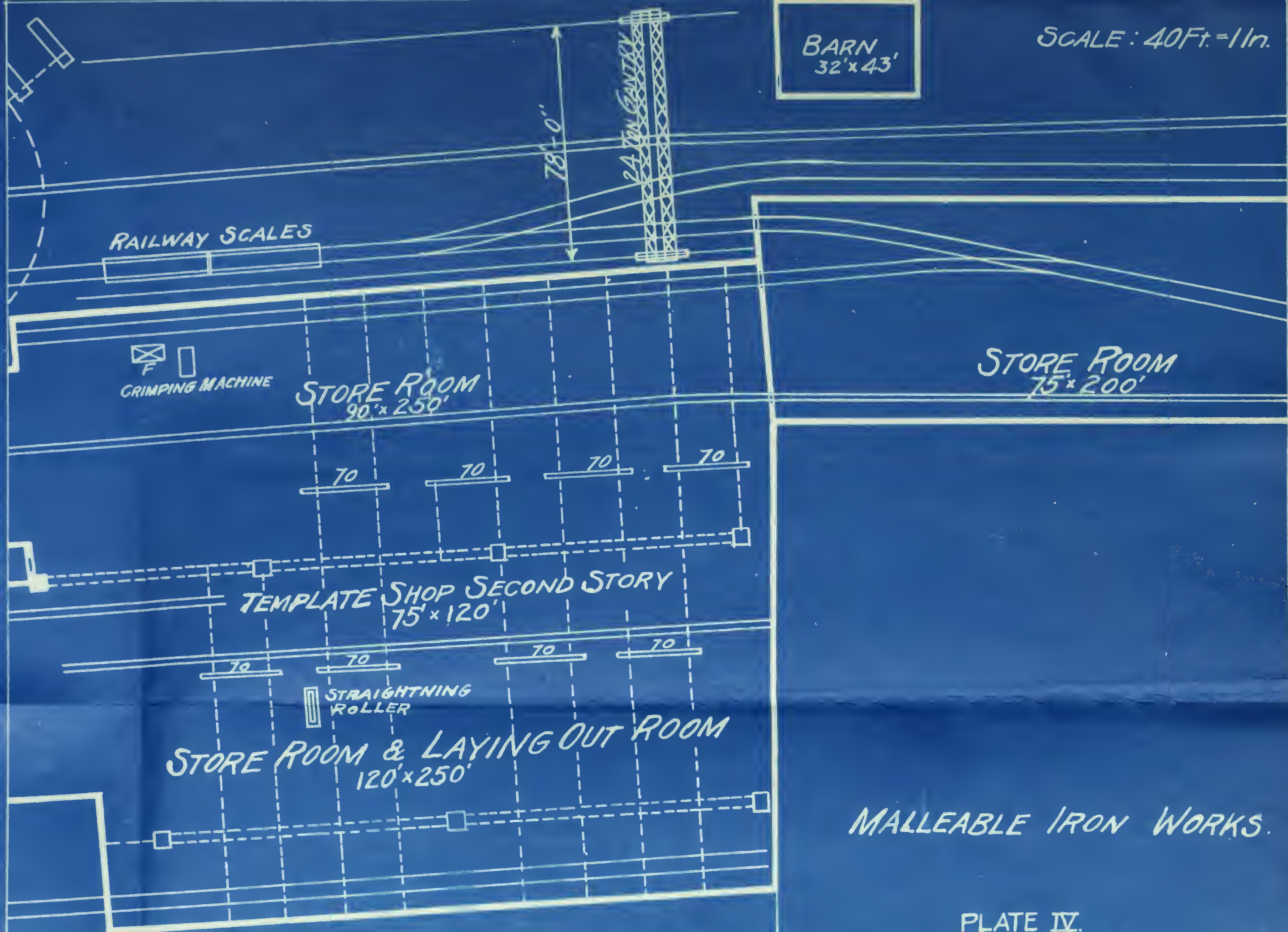

SCALE: 40 Ft. = 1 In.
SCALE
F
F
F
RIVET SHOP
75'×220'
ASSEMBLING SKIDS
PUNCH SHOP
15000 GAL.
WATER TANK
UP
30 REAMERS
9 REAMERS
REAMING SHOP
30 REAMERS
PUNCH SHOP
75'×160'
17 REAMERS
RAILWAY SCALES
OIL FURNACE
BENDING ROLL ROOM
66'×115'
BENDING
ROLLERS
SCRAP SHED
45'×50'
HAMMER SHOP
80'×120'
OIL FURNACE
BLACKSMITH SHOP

PLATE III.



SCALE: 40Ft.=1In.

MALLEABLE IRON WORKS.

PLATE IV.

UNIVERSITY OF ILLINOIS-URBANA
3 0112 086764450